

3S Trailer Suspension

Meeting # 17

Start Date & Time: 12:00pm, Tuesday, 7/21/2020

Members Present: Anson, Caitlin, Kirk, Robert

End Time: 1:00pm

Last Meeting:

Value Proposition

First Attempt

There have been minor improvements to trailer suspension for the last 40 years. (Don't know if this number is correct) Our team of engineers is creating a new and innovative suspension system for a wide range of trailers. This trailer has the capability to go from dependent to independent suspension using a first-class lever system for varying levels of terrain. By creating solid works models and testing the stresses on our suspension system we will be able to carry a range of loads from 2000lbs up to 6000lbs. The goal in the future is to implement our suspension system onto as many trailers as possible.

Second Attempt:

There have been minor improvements to trailer suspension for the last 50 years. The '3S Suspension System' is an innovative suspension system that is cheaper and performs better off road than its competitors. The system utilizes two coupled first class levers, keep trailer from tipping in sharp turns and under heavy wind loads. The trailer is designed to allow independent configuration for off-road usage by simply retracting a pin. By creating solid works models and testing the stresses on our suspension system we will be able to manufacture a range of loads from 2000lbs up to 6000lbs that meet federal safety standards. These models can then be used alongside a manufacturing plan to fabricate the designs. The goal in the future is to implement our suspension system onto as many trailers as possible.

Notes from Swenson about Value proposition

Some examples:

1) "...is cheaper and performs better off road than traditional leaf-spring trailers". We do not have a requirement or goal to make a cheaper design. Plus, the design is expected to perform better "on-highway" instead of off-road. I would also recommend that you define what "performs better" actually means.

2) "The trailer is designed to allow independent configuration for off-road usage by simply retracting a pin". This is a small design detail that actually confuses the message instead of clarifying it. Plus, this is not the PRIMARY goal of the design.

3) "By creating SolidWorks models and testing the stresses on our suspension system we will be able to manufacture a range of loads from 2000lbs up to 6000lbs that meet federal safety standards". I don't know what this means. "Testing the stresses..." is not enabling you to manufacture. Plus, I am not sure what "federal safety standards" you are referring to.

4) "These models can then be used alongside a recommended manufacturing plan to fabricate the designs." I think you need to find a better way to say this.

5) "...as many trailers as possible." is overstating the goal. Actually, the goal is to take the drawings to several potential trailer manufacturers potentially negotiate a partnership to manufacture and sell the design.

It feels like you are trying too hard with this value proposition statement. Stick to the main things, which are:

- Trailers of all shapes and sizes are used every day to haul goods, animals, recreational vehicles, and many other purposed.
- Most trailers include simple leaf spring (or Torflex™) designs that have not evolved for decades, with each side of the suspension independent from the other.
- Existing independent designs will lean during cornering or high cross-winds (or when the load is unevenly distributed), making them less stable.
- The 3S suspension design creates a fully dependent system in which each side of the suspension helps to support the other, reducing lean and substantially increase stability.

- We have created completed 3D Solid models, drawings, and BOMs for designs to meet three market capacity needs (2000 lb, 3500 lb, and 6000 lb.) and serve as "drop-in" replacements for existing suspension/axle systems.
- Detailed designs enable the team to approach several trailer manufacturers and potentially negotiate a partnership to manufacture and sell the design.
- In addition, a small-scale prototype (~XX inches long) will be built to enable demonstration of the physics of the new design on a "tabletop" scale.

Third Attempt

There are many different types of trailers, that have a great deal of purposes. The most common suspension system on trailers are leaf spring or Torflex designs that have minimal improvements for decades. These systems have independent suspension on both sides of the trailer, and they work separately from one another. These designs will lean during cornering or high crosswinds. This causes the weight of the trailer to be unevenly distributed and it makes it less stable to carry cargo. The 3S suspension design creates a fully dependent system in which each side of the suspension helps to support the other, reducing lean and substantially increase stability. We have created completed 3D Solid models, drawings, and BOMs for designs to meet three market capacity needs (2000lbs, 3500lbs, and 6000lbs.) We want our 3S trailer system to be replacements for existing suspension/axle systems. Our team will approach several trailers manufactures and negotiate a partnership to manufacture and sell the design. A small-scale prototype (approx. 14inches in length) will be built to visually demonstrate the physics of the 3S suspension system.

Over 380,000 trailers were manufactured by approximately 250 companies in the United States-Mexico-Canada Agreement (USMCA) in 2018 ranging in a multitude of different sizes and shapes used to hall goods and many other purposes. Most of the trailers used on the road today implement a simple leaf spring (or Torflex™) design for the suspension that has not evolved in decades, with each side of the suspension being completely independent from the other. Existing independent leaf spring designs will lean to either side when a load is unevenly distributed on the trailer, during cornering, or while experiencing high crosswinds, making the trailer less stable and at risk of tipping.

The 3S suspension design creates an interchangeable suspension between an independent and fully dependent system in which each side of the suspension helps to support the other, reducing lean and substantially increasing stability on the road while giving the operator the

ability to adjust the suspension accordingly to road conditions. We have created completed 3D Solid models, drawings, and BOMs for designs to meet three market capacity needs (2000 lb, 3500 lb, and 6000 lb.) and serve as "drop-in" replacements for existing single axle suspension systems.

Detailed designs with ease of manufacturability in mind, enable the 3S team to approach several trailer manufacturers and potentially negotiate a partnership to manufacture and sell the design. In addition to these designs, a small-scale prototype (~14 inches long) will be built to enable demonstration of the physics of the new design on a "tabletop" scale.

New springs

<https://www.acehardware.com/departments/hardware/specialty-hardware/springs/5214788>

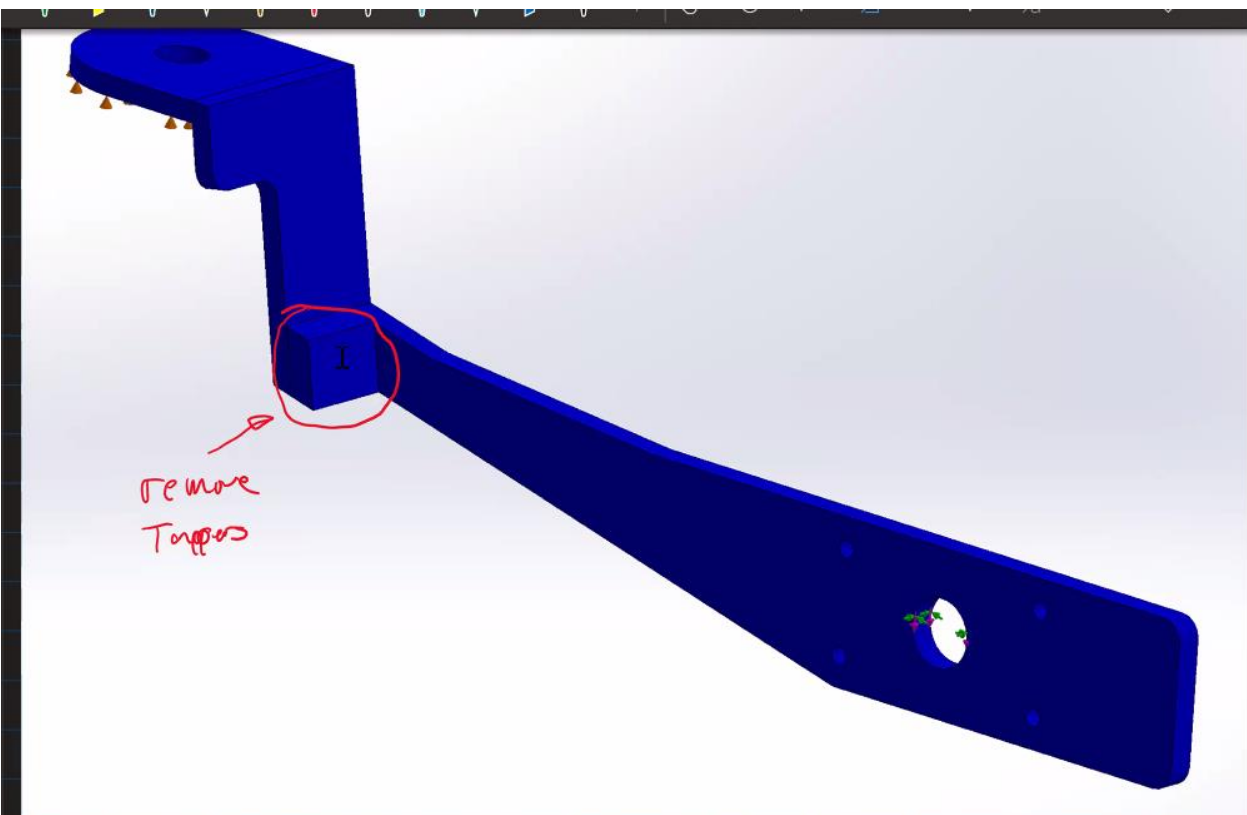
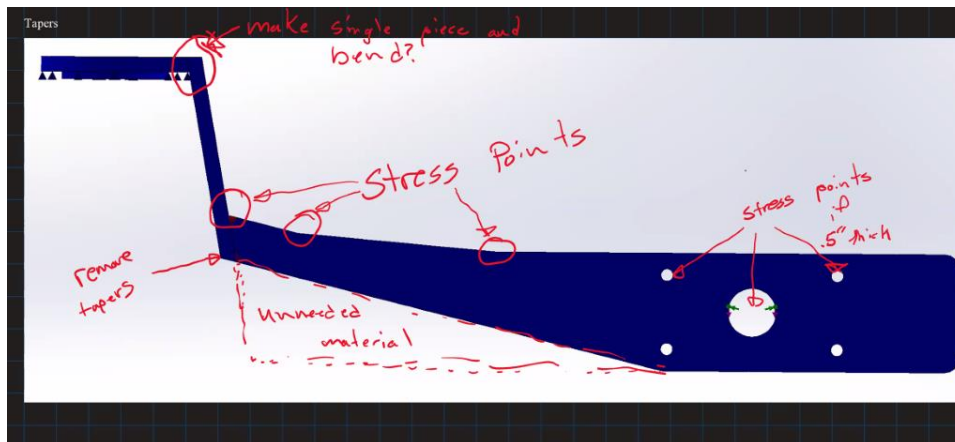
<https://www.acehardware.com/departments/hardware/specialty-hardware/springs/5214713>

Today's Objectives:

- Design reviews debrief
- Choose a value proposition
- Start on presentation
- Start on redoing drawings

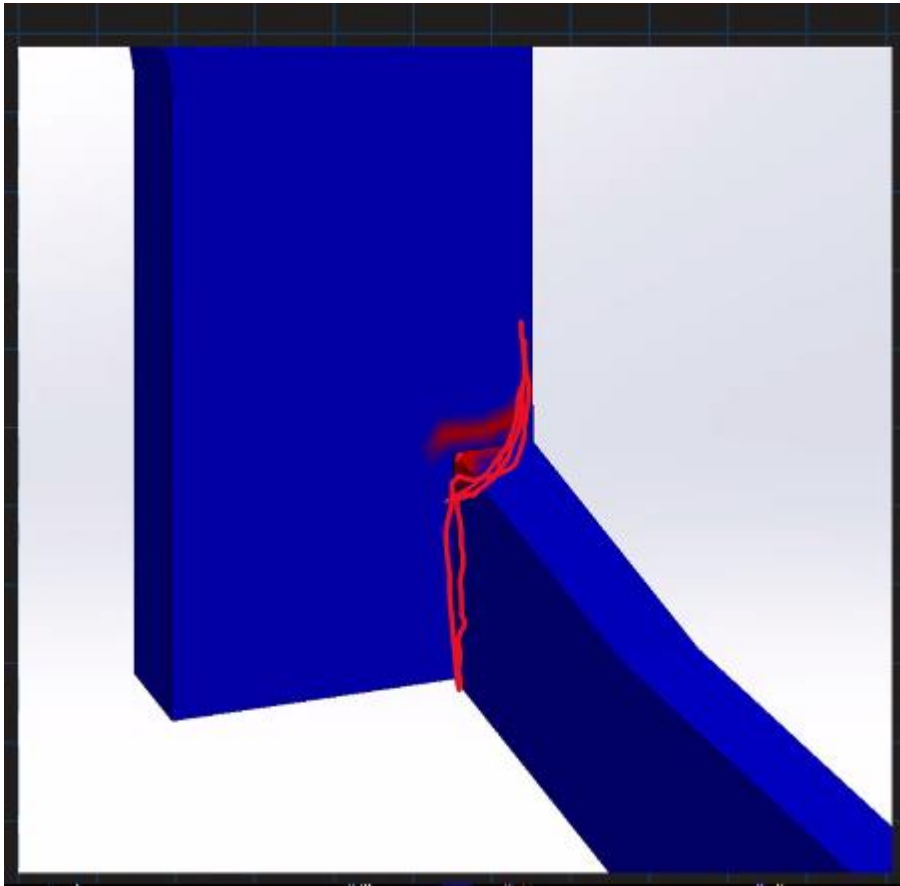
Notes:

- We are going to pick the one we like the best
- Swenson - Doesn't like the straight weld to the axle on the one side of the rocker arm, don't need the spring-loaded pin on the other side
- How to document weldments - "go back to ME325"



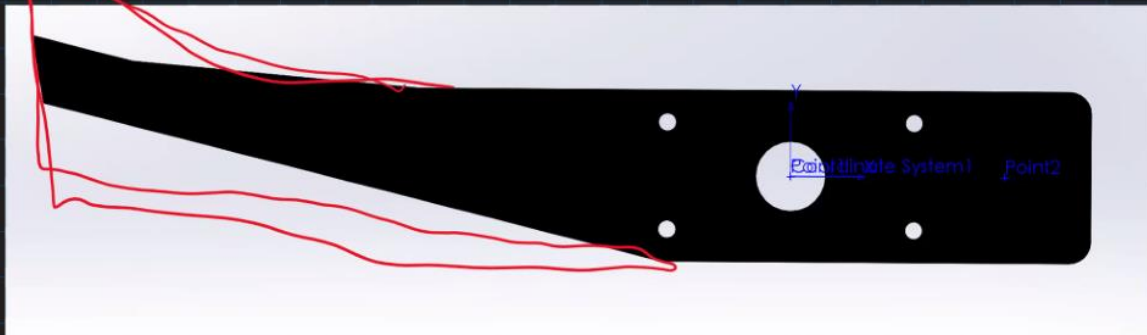
- Extra piece - not needed - still doesn't want it

- How do you model a weld that's not straight
- Just make it thicker



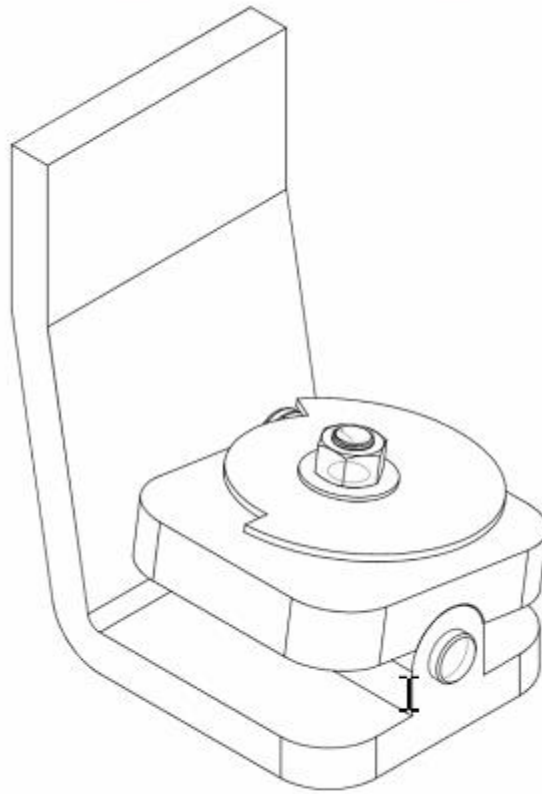
Slides 17-20 (Redundant)

Driver Side



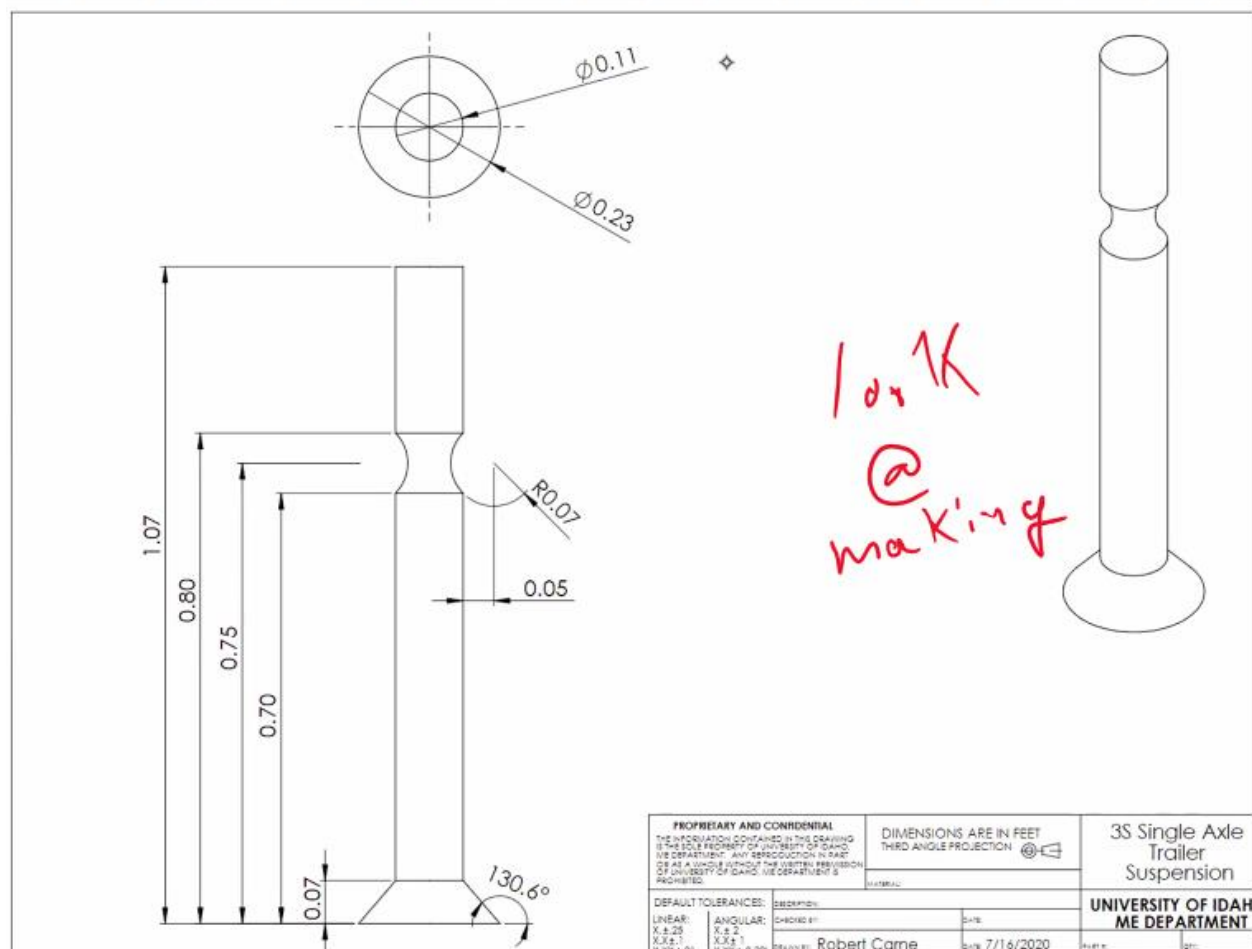
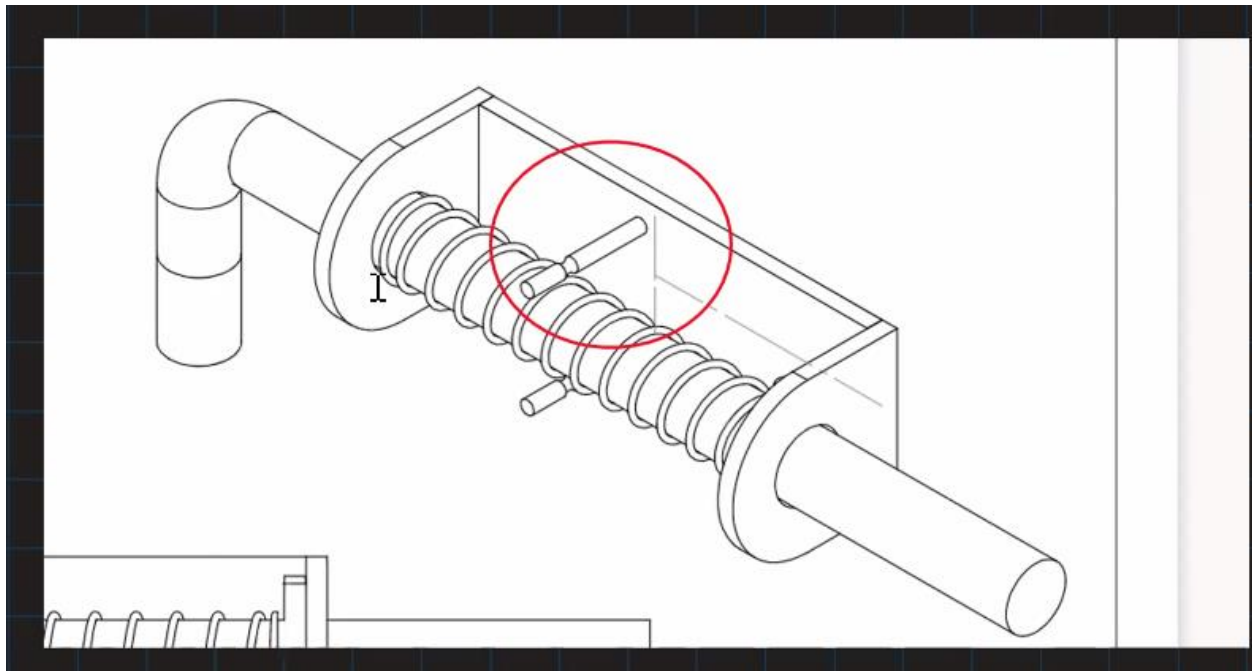
Passenger Side - Also welded different





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- "not Manufacturable"
- Metal on metal - not good



- Anson is talking about the prototype
- Make it durable
- Doesn't have to make it exactly scaled down - we need it to last

- Technical presentation
- Start looking at it
- No poster storyboards!!
- Heads down and start getting the design done
- Get the 2000lb dialed down and fix and a good set of drawings
- Then scaling up to the next capacities

For Next Time:

- Get started on redoing lever arm
- Redo drawings
- Finalize 2000lb model

Comments/Concerns/Reflections from Today:

- Major drawing changes
- Some design changes

Next Meeting Time & Date: Thursday, 7/23/2020, 10:00am